International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

AI Enhancement Automated Movement Detection

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ABSTRACT

This paper introduces an innovative artificial intelligence (AI) method aimed at tackling the challenges associated with detecting and tracking moving objects in video surveillance systems. By utilizing self-organization through artificial neural networks, our approach effectively manages scenes with dynamic backgrounds and gradual changes in lighting, ensuring robust detection across different types of videos recorded by stationary cameras. In the realm of moving object detection, our method leverages the adaptability of neural networks, enabling precise detection in complex visual environments. For object tracking, we propose a combination of Kalman filtering techniques and a sophisticated matching model based on Multiple Hypothesis Testing, ensuring accurate and consistent tracking across frames. Through experimental validation using various color video sequences, we demonstrate the effectiveness and reliability of our approach, highlighting its potential to enhance the performance of surveillance systems in real-world scenarios.

1. INTRODUCTION

Motion sensors, also called motion detectors, are electronic devices that detect and measure movement nearby. They're commonly used in home and business security systems but also have many other uses, like in mobile phones, paper towel dispensers, video game consoles, and virtual reality systems. Unlike regular handheld sensors, motion sensors are usually part of embedded systems, made up of three main parts: a sensor unit, a small computer, and mechanical hardware. These parts can be customized to fit different needs. For example, motion sensors can turn on lights, set off alarms, activate switches, or even alert the police when they detect movement.

Motion sensors fall into two main types: active and passive. Active sensors have both a transmitter and a receiver. They detect motion by analyzing changes in sound or radiation that bounce back to the receiver. When something interrupts the sensor's field, it sends an electric signal to the computer, which then triggers the mechanical part. One common type of active sensor uses ultrasonic technology, which sends out sound waves to detect objects accurately. signal to the computer, which then triggers the mechanical part. One common type of active sensor uses ultrasonic technology, which sends out sound waves to detect objects accurately.

2. Literature Survey

S No	Title	Author	Methodology	Research Gap
1	PIR SENSORS	VENKATESH PRASAD	PIR Sensors	•PIR motions sensors can detect objects even in dark. •These sensors cannot be operated above 350'c.
2	Review of artificial intelligence techniques in imaging data acquisition, segmentation and diagnosis for COVID- 19. (2020)	Shi, F., Wang, J.; Shi, J.; Wu, Z.; Wang, Q. Tang Z. He, K.; Shi, Y.; Shen, D	IMAGE DATA ACQUISITION	Several studies repo little or no power of generalization, wher evaluating the train models in their own sets. Even the model that were trained us pre-processing techniques, which tr to eliminate the bias belonging to the dat sets, showed limited results. Therefore, most of the results achieved so far
3	Face Detection and Recognition System (2020)	Gurlove Singh Amit Kumar Goel	DIGITAL IMAGE PROCESSING	Massive data storage burden. The ML technology used in fa detection requires
				powerful data storage that may not be available to all users. Detection is vulnerable potential breach of privacy.
4	OBSTACLE DETECTION AND THEIR MOVEMENT FOR AUTOMOBILE	Anusha. S	Obstacle Detection	•Easly detect any obstacles that are moving infront of them. •It takes more time to detect the moving. •Obstacle detection has been the topic of much concern since past few decades. •The most common myth of accident being unavoidable is a bane of any society. •Accidents can be unintentional and sometimes can be random but are generally found to occur due to the unexpected obstacles
5	ULTRA SONIC DISTANCE MEASURING DEVICE	JOHN ELENDALE EDEN	It uses ultra-sonic sounds for measuring the distance between the sensor and the object.	•In order to conduct the study, the researchers created an ultrasonic distance measuring device prototype. •The researchers compared the price of the device's components and the distance it can measure to the

				devices that are widely available. •Then, the researchers tested the device's capabilities such as accuracy, and precision the twenty-five repetitions.
6	Moving Object Detection in Video Surveillance	Nitin Janwe	This model also caused advancement in the computer vision	•This chapter presents a review and systematic study on the moving object detection and surveillancing of the video as they are important and challenging task in many computer vision applications. •Such as human detection algorithm, vehicles detection, threat, security. Video surveillancing in a dynamic environment. •Hand gesture recognition system received great attention in the recent
7	Hand Gesture Recognition	Rafiqul Zaman Khan	In this journal deployment of the	•Hand gesture recognition system
8	Exposure time of microwave-based welding of different materials	Sachit Vardhan	A new, innovative and promising technique that goes hand in hand with a significant saving in processing times of metallic materials is being studied. As talking about the fraction by electromagnetic irradiation. This technique is based on the application of microwaves that allow the generation of high temperatures.	•It can be useable for melting high centrgrated metals. •It has high radiations.

3. PROPOSED SYSTEM

3.1 Existing System

In today's market, there exists a plethora of theft prevention solutions employing microcontrollers. This project specifically centers around a theft alarm system utilizing a Passive Infrared (PIR) sensor for detection and SMS notification for alerts. When an intrusion is detected by the PIR sensor, the system initiates a message sending process to notify relevant parties.

3.2 Proposed System

The ARDUINO UNO board serves as the foundation for executing code developed in the ARDUINO IDE, written in Embedded C, facilitating the integration of various components. The centerpiece of this circuit is the ATMEGA microcontroller, specifically the ATMEGA328, which serves as the primary device. A bell is incorporated into the setup, along with a SIM module and a PIR sensor, all interfaced with the Arduino. Upon detection of an individual by the PIR sensor, the alarm is activated, and the SIM module dispatches a message to the user. Additionally, a camera is employed to record video footage of the current location, which is then uploaded to a server for user access. The detection of motion or movement is fundamental across numerous industries, and the Human Movement Sensor facilitates this process. This project demonstrates how to connect a Human Movement Sensor to a microcontroller such

as Arduino, enabling the blinking of an LED and the initiation of video capture on both a local machine and an Android device.

IMPLEMENTATION AND TESTING

3.2.1 View of a person without motion

Figure 3.1: Person without motion

3.2.2 View of a person with motion

Figure 3.2: Person with motion

3.3 Feasibility Study

A feasibility study is conducted to assess the practicality of the project and to evaluate the strengths and weaknesses of the proposed system. It involves analyzing the application and usage of sensors in crowded areas. The feasibility study is conducted in three primary aspects:

- Economic Feasibility - Technical Feasibility - Social Feasibility.

3.3.1 Economic Feasibility

The proposed system does not necessitate expensive equipment. This project can be developed using readily available software.

3.3.2 Technical Feasibility

The proposed system operates solely on a sensor-based model. The primary components utilized in this project include PIR sensors, transmitters, and receivers. These tools are readily accessible at no cost, and the technical skills necessary to implement them are manageable. Based on these factors, it can be inferred that the project is technically viable.3.3.3 System Specification

3.3.3.1 Hardware Specification

Processor - Intel i5-8250 CPU @1.60GHz 1.80GHz• 512 GB SSD

- NVIDIA GEFORCE RTX
- CPU QUAD CORES

3.3.3.2 Software Specification

- Passive Motion Sensors
- Active Motion Sensors

4. ARCHITECTURAL DIAGRAM

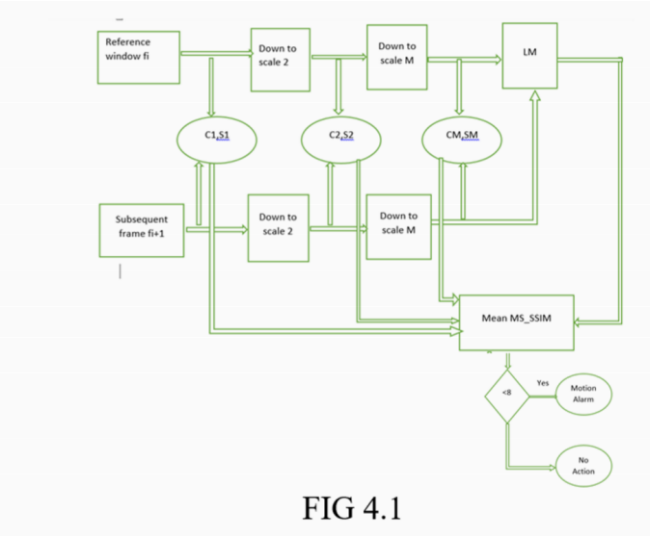

FIG 4.1

Figure 4.1 represents the architecture diagram of the project. Firstly, the input is taken from the camera and algorithm is trained using data sets, which is used as training data. The input taken from the camera will extract the images in the capture. Then the images are forwarded to SSD model and detection model is loaded using MobileNetV2.Then image processing techniques are applied to the captured image and then now mask classifiers are used to determine whether the person is wearing mask or not by outlining the face area.

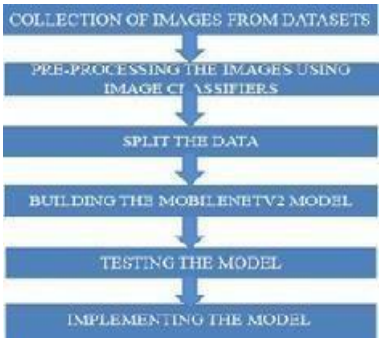

FIG.4.2

Figure 4.2 represents the flow diagram of our project. The data sets of persons who are wearing mask and not are collected using Kaggle data sets. The Pre-processing step includes resizing the image as according to the system requirement, image is pushed into the array, processing using Darknet53 model, and hot encoding is per- formed to labels. The data splitted into 75 and 25 percent to meet the requirements of the model.75 percent is allocated to training whereas 25 percent is allocated to testing the data. And the next step is building the model, it is carried out by using MobilenetV2. Testing is done to check the viability of the project. Finally, the model is implemented by carrying out all this processes.

5. RESULT

The objective of these experiments is to emphasize the significance of motion detection within video

surveillance systems, particularly concerning video compression, human detection, and behavior analysis. While numerous methods have been employed for detecting motion in continuous video streams, it's imperative for real-time surveillance systems to possess a motion detection mechanism capable of providing accurate results even in dynamic backgrounds, irrespective of environmental conditions (indoors or outdoors), object velocity and dimensions, and resilience to camera noise or sudden fluctuations in light intensity. This is crucial to maintain the security of monitored areas or parameters without compromise. In this study, we propose a methodology for human motion detection that integrates adaptive background subtraction, camera noise reduction techniques, and a white pixel count threshold for analyzing real-time video streams.

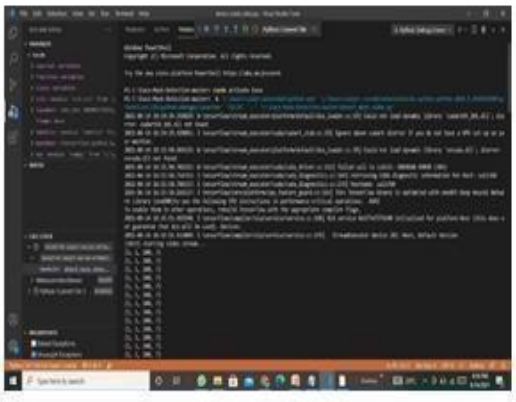

FIG.5.1

6. Conclusion

The system is engineered to detect motion utilizing a motion detection sensor and subsequently relay this information to the user through a GSM module. The potential for future enhancements in security applications is vast, particularly in safeguarding residences, companies, organizations, and various governmental offices. Therefore, this project holds immense value in enhancing security measures for humanity

6.1. Future Enhancements

Motion sensors serve as integral components within security systems deployed across commercial and residential sectors, responding to the escalating concerns surrounding theft and robbery incidents. The imperative need for enhanced security measures has driven widespread adoption in diverse settings including homes, shopping malls, offices, and banks. These sophisticated systems are designed to promptly detect intruders, triggering alert notifications for swift response and mitigation of potential security breaches. Moreover, they boast seamless integration with smartphones, wearables, and tablets, enabling users to receive real-time notifications in the event of suspicious activities, thereby bolstering vigilance and control over their premises. Furthermore, the burgeoning demand for smartphones and tablets, coupled with the thriving interactive gaming industry, stands as a significant driver of market growth. This trend is complemented by the integration of motion sensors into an array of electrical appliances, facilitating energysaving functionalities by automatically deactivating devices during periods of prolonged inactivity. In addition, the rising disposable incomes and rapid urbanization have spurred the adoption of automated devices such as hand dryers, doors, and faucets, further propelling market expansion. Motion sensors play a pivotal role in optimizing the functionality of these automated

systems, enhancing efficiency and user experience. As urban lifestyles continue to evolve, the demand for intelligent, sensor-equipped solutions is expected to surge, driving continued innovation and growth within the motion sensor market.

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